Reflections on SDSI

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Lampson Fest

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Context 1970–1990

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- X.509 hierarchical public-key infrastructure and certificates (1988). Envisions strict hierarchy of certificate authorities.
- Invention of World Wide Web (TBL, first browser 1990) – causing explosive growth of digital communications and e-commerce.

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- Do we really need CRL's?
- ...much discussion and unhappiness with existing framework and tools...

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- Carl Ellison gives many “use cases” not yet well handled, such as granting of permissions.
- Inspired by earlier work by Lampson, Ellison also argues for elimination of names in favor of using public-keys as the *only* handles (identifiers) for principals.

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- Lampson emails (1 mar 96):
  “So my belief is that anything people have to look at should be stated in terms of meaningful names, not keys. The keys should be kept internal to the system. Of course you can say that you’ll have extra certificates linking names to keys, but the names will still be the "real" thing. It’s true that the system takes action based on messages being signed by keys, but the configuration, which is the important thing, is established in terms of names, since that’s the only way people can describe it. So it must be that the names are the real thing and the keys just an internal mechanism. ”

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- Especially if names are non-hierarchical?
- Who is relevant “CA” for a name?

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$$PK.identifier$$

- PK is the only PK authorized to sign bindings for *PK.identifier*. Certificate thus has form:

$$\text{PK.identifier} \Longrightarrow \text{PK' (signed by PK)}$$

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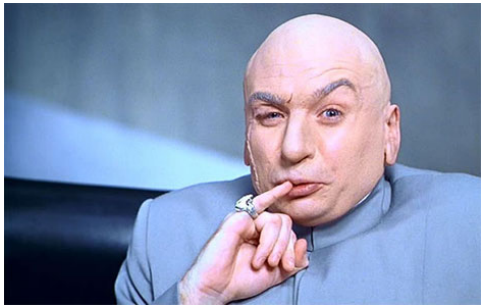
- Name conflicts avoided; global uniqueness OK.
- Names can naturally refer to *groups*.
- *Extended names* have a nice algebra:

  $$PK.Microsoft.Research.ButlerLampson$$

  chains four name spaces together to give nice indirect handle for Butler, even if I only know public key of Microsoft; Certificate can bind to extended name:

  $$PK.butler \Longrightarrow PK.Microsoft.Research.ButlerLampson$$

What happened to World Domination?



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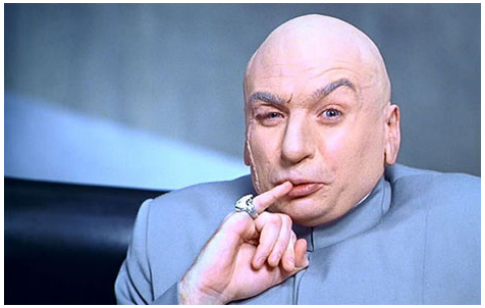

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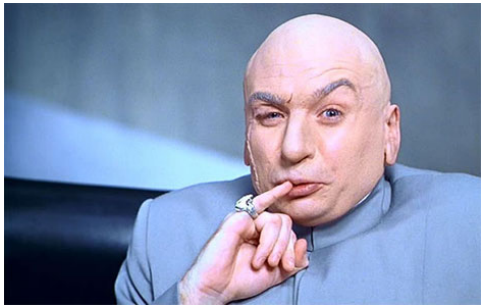

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- Elegant naming algebra still leaves an interesting (but solvable) search problem for finding certificate chains. This starts with (requesting) key, and finds explanation why it is implied by ACL.
- In practice, search problem is often vaguer: given attributes of another principal, find their public key.

Thanks and Happy Birthday, Butler!